A NOTE ON MIGRATIONS OF **VANESSA KERSHAWI** (McCOY) (LEPIDOPTERA: NYMPHALIDAE) IN AUSTRALIA, 1963-1968

By C. N. Smithers
(The Australian Museum, College Street, Sydney)

(Figure 1.)

Smithers and Peters (1966) reported a migration of *Vanessa kershawi* (McCoy) (Painted Lady Butterfly) which took place in south-eastern Australia in 1963 and summarised the earlier literature on migrations of this species in Australia. The data presented were obtained through the efforts of co-operators, in many parts of Australia, who are participating in an insect migration study scheme organised from The Australian Museum. Additional data, collected from 1964 to 1968, are now available for consideration and comparison with the previous data and are presented in this paper. Tables I, II and III give data for 1966, 1967 and 1968. All Australian localities mentioned are in the State of New South Wales unless otherwise stipulated (e.g. Q = Queensland and ACT = Australian Commonwealth Territory).

Perusal of the tables leads to certain obvious conclusions.

The size of the migrating populations varies greatly from year to year. In 1963 migrations were obvious and reached a frequency of passing individuals of about four per minute in a front of fifty yards. There were no reports of movements during 1964 and 1965 although observations were being made. In 1966 the migration was quite spectacular, reaching frequencies of over one hundred per minute over fifty yards at the peak of activity. In 1967 only a very small migration was noticed. In 1968 the movement was again quite spectacular and numbers up to over fifty per minute over fifty yards were reported. In all probability there is some movement each year although none was reported in 1964 or 1965, but in years of low populations movements may be overlooked. 1967, which was also a year of low populations generally for this species, produced only two observations of movement from two areas; in one area it is doubtful whether movement was really unidirectional.

The direction of movement nearly always includes a southerly component. The movement is usually reported as WSW, SW or S; a few westerly movements have been reported and there has been one report of a movement to the SE and one to the NW (at a time of exceptionally strong southerly winds).

The length of time over which migration takes place is quite long. In 1963 it covered a period of about eight weeks and in 1966 and 1968 about 7 weeks; in 1967 it was only observed over a week. It seems that a seven to eight weeks migration period can be expected in years of obvious movement. The short period in 1967 could be due either to lack of observations on a small population or the period could really have been short. It is not possible to decide which was the case on the data available.

The time of year at which the movements take place, despite the apparent constancy of period length, has varied considerably. In 1963 the first movement was seen on 13th August, with a peak of activity for Sydney from about 13th to 16th September; the last movement was reported on 9th October. In 1966 the migration took place much later; the first movement was reported on 11th October with a peak of activity over the period 30th October to 9th November. The last southerly movement was reported for the 28th November but there was a single, very late, report of movement to the west on 20th December. This migration did not, apparently, start until the time of year by which the 1963 movement had ended. The 1967 movement was too small to be of much significance so far as time of year is concerned; what little of it was reported took place in the last week of September and this, presumably, represented the "peak" of whatever migrations there were. In 1968 the first reports were on 13th September with strong activity lasting, in Sydney, over the long period 28th September to 23rd October. Records from

areas other than Sydney suggest that the major flights also took place at about the same time elsewhere, that is, in late September and the first three weeks of October. By the 4th November movement had ceased through Sydney.

The "peak" periods for the three years of large movements were, in Sydney, mid-September (1963), early November (1966) and late September to the third week of October (1968).

The areas through which movements have been reported form, essentially, a broad strip down the eastern part of the continent from Brisbane southwards. From year to year, however, the areas involved appear to have varied. This may, to some extent, be due to non-reporting by co-operators or by co-operators increasing or decreasing in number in different parts of the country. In 1963 reports of movements and/or sudden increases in numbers came from Glen Innes to Tasmania and from the coast to localities well west of the mountains. In 1966 reports were from Wyong Creek to Canberra and as far west as Dubbo. 1967 produced reports from only Sydney and Wanganella. In 1968 reports have come from Brisbane to Nowra and from the coast to as far inland as Wagga Wagga. The 1963 movement covered a front stretching at least from the coast to Finley, a little less than three hundred miles; in 1966 the front was from the coast inland at least to Dubbo, just under two hundred miles; in 1967 actual movement was reported only for the coast and in 1968 the furthest inland report was from Wagga Wagga, indicating a front of at least a little over one hundred and fifty miles.

Although it has long been known that *V. kershawi* was a strong migrant like its near relative *V. cardui* (Linnaeus) in Europe, little detail has been published of the duration, extent and variation in its movements. This basic information, necessary for planned study, is now slowly becoming known and ability to predict the time and extent of movement would be a help in planning future work.

On the data at present available it can be said that in years of reasonably high populations a generally south westerly migration can be expected to start at any time between mid-August and early October and that the movements will continue for seven to eight weeks, varying in intensity, but showing some degree of increase in numbers to a peak of activity with subsequent falling off. The migrations may be noticeable from southern Queensland to Tasmania and be on a front of three hundred miles inland from the coast.

The suggestion was made (Smithers and Peters, 1966) that years of heavy rainfall may coincide with big migrations as this is said to be the case with *V. cardui* (e.g. Sanders, 1948, p. 157). Without precise knowledge, however, of the distribution of breeding areas, the time of breeding and other biological and ecological information, it is not possible to say whether rainfall was directly or indirectly related to the migrations of *V. kershawi* reported here.

An interesting phenomenon, apparently associated with large-scale migration in eastern Australia, is the appearance of Australian species in New Zealand (Ramsay, 1966; Gibbs, 1961). Wind assistance is generally believed to be involved in carrying specimens from Australia to New Zealand. When more details are available on the precise arrival dates in relation to weather and migrations in Australia closer investigation will be possible.

V. kershawi has recently been recorded for the first time on Norfolk Island; it was present in large numbers in the second half of November, 1968 (Smithers and Peters, 1969). The date of the first appearance on the island is not known but it must have been during the first half of November at the latest. This is the period during which the 1968 migration was declining in eastern Australia. Conditions at low altitudes were not particularly favourable for rapid movement across the sea. There were, however, storm conditions along the coast of northern New South Wales in which strong updraughts of air were involved. Also, the air conditions in many parts of eastern Australia

were such that strong updraughts from extensive bushfires were common. Over wide areas, therefore, conditions were favourable for the rapid lifting of specimens in flight to heights of 15,000 feet and more. At these heights the winds were easily capable of transporting specimens to Norfolk Island in a matter of hours. The temperatures at such altitudes were below freezing and the passive movement of torpid butterflies could have been quite rapid; certainly a short enough period of time would be involved to permit the butterflies to descend unharmed. At the time of the records of *V. kershawi* on Norfolk Island the atmosphere over the island was clouded due to the smoke from Australian bushfires.

A population of passively drifting butterflies at high altitude presumably loses individuals by descent as it moves along with the high altitude air movement. Turbulence over land or convergence phenomena could cause the descent of a larger number of individuals in greater concentration; hence the appearance of numbers of specimens in the vicinity of one another (relatively speaking) over land.

If the movement to areas such as Norfolk Island is entirely passive the phenomenon should be regular because the species is regularly present in its "home" area and species other than migrants should be involved. Most species reported arriving in New Zealand, however, are migrants or suspected migrants from Australia.

This apparent species "selection" is probably explainable by considering the flight habits of butterflies in relation to wind and population density. A dense population is more likely to have individuals lifted from it and transported in detectable numbers than is a sparse population. Although migrants migrate every year their populations are not always high enough to permit detection of the movement in its usual habitat. This would account in some degree for irregularity by wind transport. Also, of course, meteorological conditions may not be such as to provide the necessary updraught and suitable high altitude wind when a species is present in numbers. At least one or other species is abundant, however, whenever conditions are suitable, even if they are not migrants, and these should be lifted and carried. That this is not often the case seems due to the flight habits of butterflies in relation to wind speeds. For a butterfly to be lifted and carried it must be flying in the air which is lifted. Most butterflies settle down when speeds near the ground increase; this would prevent their being lifted. It is characteristic of a migrating population that its members tend to be far more persistent than those of a non migratory population in their flight activity when wind speeds rise. Migrating specimens (e.g. of *V. kershawi*) can be seen being carried along by a following wind, being blown at an angle to their line of flight by a cross wind or striving against a head wind which is actually blowing them backwards. They continue to fly persistently in strong winds which would have caused non-migrating populations to settle or seek shelter.

Non-migrating populations tend to settle or seek shelter in just those conditions of increasing wind velocity which increases likelihood of their being lifted and transported; they seldom, therefore, reach the areas mentioned although their populations may well be greater than those of migrant species in the area of origin of the winds.

Migrating populations display this persistence in flight and migrant species thus form a high proportion of those which are carried rapidly over long distances by air and appear in numbers in areas such as New Zealand and Norfolk Island at a time when migrations are in progress in Australia.

ACKNOWLEDGEMENTS

I would like to thank the many co-operators who have so kindly recorded and submitted the data on which this paper is based and officers of the Bureau of Meteorology, Sydney, for providing information on weather.

SUMMARY

Data on migrations of *Vanessa kershawi* (McCoy) in eastern Australia for 1964-1968 are given and discussed with previously published data for 1963. Reasons for sudden appearances of Australian migrant species in areas such as New Zealand and Norfolk Island are discussed.

REFERENCES

Gibbs, G. W., 1961.—New Zealand Butterflies. *Tuatara* 9:65-76.

Ramsay, G. W., 1966.—The Australian Blue Moon Butterfly *Hypolimnas bolina nerina* (F.) in New Zealand. *N.Z.J. Sci.* 9:719-729.

Sandars, E., 1948.—*A butterfly book for the pocket.* London.

Smithers, C. N., and Peters, J. V., 1966.—A migration of *Vanessa kershawi* (McCoy) (Lepidoptera: Nymphalidae) in Australia. *J. ent. Soc. Qld.* 5:67-69.

Smithers, C. N., and Peters, J. V., 1969.—The Butterflies of Norfolk, Nepean and Philip Islands. *Austr. Zool.* 15:185-187.

Figure 1.—Map of eastern Australia, New Zealand and Norfolk Island, showing localities mentioned in text and tables.

TABLE I

MIGRATION RECORDS FOR *VANESSA KERSHAWI* (McCOY)—1966

Locality	*Dates*	*Direction*	*Numbers*	*Observer*
Wyong Creek	1.xi.66	SW	"41/min/44 ft."	E. A. Hurst
Wyong Creek	20.xii.66	W	"Strong migration"	E. A. Hurst
Dubbo	23-27.x.66	SW	"Many hundreds"	R. Gilroy
Bandon Grove	23-25.x.66	WSW	"Many"	W. Dowling
Katoomba	18.x.66	SW	"Many dozens"	R. Gilroy
Katoomba	2.xi.66	SW	"Many dozens"	R. Gilroy
Lucas Heights	2.xi.66	SW	"30-40/1 min./20 yds"	M. Copland
Heathcote	2.xi.66	SW	"30-40/1 min./20 yds"	M. Copland
	11.x.66-22.x.66	—	First appearance followed by increase in numbers	C. N. Smithers.
Sydney area	30.x.66	S	1/5-10 min./50 ft.	Based on many observations of: S. Ross, C. N. Smithers, A. S. Smithers, D. Sault, J. V. Peters, B. Brown, W. Wright, G. Holloway.
	31.x.66	S	Large numbers	
	1.xi.66	S, SW, W	Peak of movement with up to 24 in 3 min./60 ft.	
	11.xi.66-28.xi.66	S, W	Numbers falling off	
Cataract Dam	2.xi.66	SW	"60/5 mins/50 yds."	B. Jessop
Wollongong	2.xi.66	—	"Many"	N. Robinson
Canberra to Mittagong	29.x.66	S	"Few"	C. N. Smithers
Canberra	23.x.66	S	"Many"	M. Upton
Canberra	24.x.66	S	"6-27/5 min./40 yds."	M. Upton
Canberra	25.x.66	S	—	M. Upton

TABLE II

MIGRATION RECORDS FOR *VANESSA KERSHAWI* (McCOY)—1967

Locality	*Date*	*Direction*	*Numbers*	*Observer*
Sydney	23-24.ix.67	S	"Few"	C. N. Smithers
	30.ix.67	S	"Few"	C. N. Smithers
Wanganella	3.ix.67	—	"Large numbers"	E. Edwards

TABLE III

MIGRATION RECORDS FOR *VANESSA KERSHAWI* (McCOY)—1968

Locality	*Dates*	*Direction*	*Numbers*	*Observer*
Brisbane	3.xi.66	NW	5	A. Bird
Wyong Creek	1.x.68-6.x.68	SW	"Quite a large migration"	E. A. Hurst
South Springwood	20.x.68	SW	"10-15/30 mins."	M. Gregg
Sydney area	21.ix.68	SSW	"Few"	J. V. Peters
	28.ix.68-23.x.68	SW, SSW and W	The main movement, varying in strength but never weak. Up to 111/5min./60 feet and probably more in some cases	Based on many observations of: C. N. Smithers, J. V. Peters, R. Moore, B. Brown, R. Jeffery, A. Rose, M. Gray.
	29.x.68	SW	Falling off	
	2.xi.68		No clear movement in area after this date although specimens common	
National Park	20.ix.68	WSW	"Many"	J. V. Peters
National Park	29.ix.68	SW	"Large numbers"	C. N. Smithers
Madden Plains	29.ix.68	SW	"Thousands"	P. Hendricks
Figtree	6.x.68	SW	"Quite a large migration"	P. Hendricks
Wagga Wagga	14.ix.68	—	"Abundant"	M. Upton
Canberra to Wagga	13.ix.68	S	"Continuously all day"	M. Upton
C'berra to Clyde Mts.	14.ix.68	S	"Movement"	I. Common
Braidwood to Clyde Mt.	6.x.68	S	"Abundant"	I. Common
Canberra	20.x.68	S	"99/5 mins./23 yds."	I. Common
Canberra	End Oct. early Nov.	S	"Large numbers"	I. Common
Sydney to Nowra	22.x.68	W	"Vast numbers"	B. Brown